

12037

[illegible][illegible]

Compactly, there is what is required to marry it to:

- [illegible]

March 2, 1965

14. As Administrator, [REDACTED]Procedure and Timing:

1. Upon receipt of funds for reconstruction of the request made, approximately 24-3 months to build the experimental equipment.
2. During this period, all arrangements preparing for the controlled experiment can be made.
3. The controlled experiment will be done well before the equipment is installed in the experimental laboratory in a suitable place where it is to be used.
4. During this week, the experimental records will be compiled over each 24-hour period on each subject.
5. During the next week, sleep records will be taken, that subjects will be given a good night's sleep, and will be given the experimental equipment and environment.
6. Having been randomly assigned the Groups A and B, subjects will then begin the controlled experiment, as follows:

	Control Group	Experimental Group
	(Sleeps on standard Army cot for the equivalent)	(Sleeps in body temperature regulation)
Week 1	Group A	Group B
Week 2	Group B	Group A
Week 3	Group A	Group B
Week 4	Group B	Group A

Salinity and just before the ventilation in order to provide (a) a suitable initial humidity per body weight, and (b) a suitable concentration of water in the air.

1. Each group will be in the lab at the same time; each group should be subjects who are doing well, will be permitted at any time during the 24-hour cycle to return to the experimental environment and rest. For sleep, provided only when the environment is that of which each group is designed for the week. Should any subjects from either group awaken after going to bed, and wish to sleep, they may use the same experimental facilities until a good night's sleep is obtained, and then will be provided.
2. During the experiment, sleep records will be taken on a daily basis. During the day, subjects will be given the experimental facilities (including ventilation, noise, and temperature).
3. All the data.

APPLICATIONS AND SUGGESTED MODIFICATIONS FOR AQUATEST

January 1963

The following paragraphs contain some suggested applications for the basic Aquatest system which may prove to extend its present scope. Perhaps some of these may prove to have very attractive markets. Some of these are random ideas which are strictly my own, others are the result of conversations I have had with friends of mine who are in the medical profession. Air Force and NASA experiments in simulated weightlessness using saline water tanks kept at approximately 92 degrees F suggest that:

1. Water immersion permits sleep needs to be greatly reduced, possibly cut in half.
2. The subject cannot stay in the water for a prolonged period of time; 16 or 17 hours would appear to be the maximum.
3. The subject should be in a saline water solution as closely approximating blood plasma as possible.

Concerning your comments on the fact that the Russians may be ahead of us in sleep research, I fully agree with you. In 1959, I was a guest of the Soviet Academy of Sciences for one month touring research institutes and universities. This was during the so-called "Era of good feeling" and quite a few Americans were invited over there in exchange for similar invitations to a number of Russians who went through similar activities in this country. I did discuss the subject of sleep one or twice with members of the Academy of Medical Sciences and they said that considerable work was being done, however, they mentioned no specific research or gathered that the research they were speaking of was more to mass

among pharmaceutical lines. However, it may be that they were only responsible for one phase of what may have been a much broader program. They were very concerned with environmental factors since their entire philosophy stresses ideal environments. Therefore, your interpretation of direction of research would stand to be more or less in their natural course of research direction. In broad ranging discussions on foreseeable results of Soviet research, a lowered sleep requirement was mentioned by more than one person. This would tie in with the well known Stakhanovistic practices which prevailed in the early 1930's and still exist to some extent, particularly among professional people. *after three*

I trust you have already contacted the National Institutes of Health to see if they had some funds available for sleep research. As you may know, the National Institutes of Health are strongly influenced by political considerations and most of the medical research funds in this country only go to areas in which the general public is aware of the need for research. Consequently, "basic research" or "blue sky research" is very poorly supported at the present time in many areas. I might add that ~~the Soviet Union~~ own principal field which presently may be broadly described as technology related to "space exploration" was in the same position in the early 1950's. In fact, astronautics really did not receive support here until 1957 when Sputnik caused us to realize that we were far behind in this particular area. So, I can sympathize with you in your frustration at a continuing tendency to ignore what would seem to be another important research area in which the Soviet Union has apparently recognized as a field of investigation with significant economic and military potential. *with*

It is of particular interest that you mention that the Aquarest has been used in the treatment of burns. It seemed to me that a saline-water solution closely duplicating that of human blood serum and containing various therapeutic or pharmacological agents could provide an ideal treatment for a severely burned subject. Saline solutions at normal pressures contain some dissolved oxygen which would feed the burned tissues. If the Aquarest were placed in a pressure chamber in which the pressure could be periodically raised to 3 or 3 1/2 atmospheres, then the saline solution could contain enough dissolved oxygen to supply as much oxygen to the burned skin tissues as would normally be supplied by a blood stream.

There have been experiments with monkeys in which all the blood has been taken out of the monkey in a chamber of 3 1/2 atmospheres. A solution was trans-fused through the monkey permitting him to live without blood cells simply ob-taining enough dissolved oxygen from the saline solution. If so many reasons why this same principle should not apply to treatment of burned areas outside the body. Possibly the patient could breathe a special mixture of gases with a much lower oxygen intake than 20% (perhaps 15 or 18% oxygen content) and remain in the pressure chamber within an Aquarest gear for a prolonged period of time.

The use of control pressures in various diseases is a comparatively new area of investigation. It is called hyperbaric research. At the present time, the leading work in this area is being conducted in Scotland and in Holland. In both of these areas they have large hyperbaric chambers enabling entire surgi-cal teams to perform operations. The chambers are large enough to contain all the equipment necessary for the various surgical procedures which are carried out under controlled pressure conditions. Recently quite a bit of publicity has been given to hyperbaric treatment of people suffering from lockjaw. It has

been found that penicillin is much more effective if a person is in an atmosphere of approximately $3\frac{1}{2}$ times normal. Several cases of severe lockjaw have been cured recently including children and elderly people by placing them in a hyperbaric chamber for several hours, increasing the oxygen tension in the tissues and administering large doses of penicillin. I think that your Aquest unit combined with a hyperbaric chamber and associated with controls could revolutionize the treatment and cure of many skin illnesses and severe burn conditions.

It may be of interest that reduced temperatures (hypothermia) have often been suggested as a means of arresting the aging process or at least reducing the rate of aging. A research program using Aquest suspensions would be an ideal medium to experiment with the possibility of reducing the temperature of a person mainly during the hours of sleep. Certain primitive people have been found to sleep at a much lower temperature than normal (in the neighborhood of 80-85 degrees F). This apparently adaptive phenomenon does not appear to be injurious to their health, in fact, it is an absolute necessity when people totally devoid of clothes are asleep without any type of blankets or protection on the bare desert where very low temperatures are frequently encountered at night. There is some debate on whether this phenomenon is hereditary or result of adaption. However, it is believed to be a result of adaption. Drugs which would stop shivering, combined with the sleep promoting qualities of Aquest, might be beneficial in experimenting with lower temperatures during the period of sleep.

If the whole subject of the aging process is extremely controversial and there are some 200 theories on the aging of mammals. Some fish do not show any signs of aging and are really more or less subject to continuous "half-life" extinction in which the slow averages eventually catches up with them through disease

or natural enemies. We know very little about the life span of mammals that live in the water or at least comparatively little. Therefore one can speculate that something similar to the Aquarest which would promote sleep should eliminate some of the effects of stress over a period of years and have a beneficial effect on longevity. In fact, it would suspect that Aquarest sleep and related therapy could add as much as 10 to 20 percent to the average life span of a reasonably healthy individual providing they started not too far along in the life cycle.

Aquarest would be an ideal means to exchange materials through the skin. Perhaps the Aquarest unit could be used in a manner similar to the artificial kidney in which skin would be cleansed and beneficial compounds in the solution could gradually enter the body. This is not a new idea, since it is also one which apparently appeals to the scientists in the Soviet Union. The famous Russian biologist, Olga Lepashinskaya, recommended the regeneration of skin by hydrotherapy in a solution of bicarbonate of soda. Whether they are doing work along this line is difficult to say, however, hydrotherapy is much more advanced in Europe than it is in the United States.

Experiments with controlled pressure research using Aquarest units might include cyclic pressures which would permit the cessation of breathing. This has been done by simply varying the pressure of the air in the lungs so that there was a cyclic change in density from say 2 atmospheres to 1 atmosphere to 2 atmospheres to 1 atmosphere and so on. It would bring in enough oxygen and remove the carbon dioxide so that all motion of the lungs ceased. There have been several experimental units built around this principle to test the theories in the treatment of tuberculosis and other lung diseases. Most of the people

that have been in these special chambers report that the effect is extremely restful. For the first time in their life they are almost perfectly still and the heart's blood is said to be greatly reduced. Conceivably sleep in Aquareset amit coupled with some type of varying technique could permit even greater relaxation and rest than anything which is known in nature. If the Aquareset is essentially an improvement on nature, it therefore this could be considered.

This whole area of research opened by Aquareset should be ideal in the training of astronauts. Here, men who will be engaged in long range missions must be reconditioned. In the not too distant future, astronauts will be required to spend considerable lengths of time in the space stations and eventually they will be going on planetary missions where periods in space will probably exceed one or possibly even two years.

The Aquareset amit would be ideal to use in various training situations with these astronauts preparing them gradually for periods of weightlessness. Some form of weightlessness stimulation using water suspension is bound to play a role in the more advanced training of astronauts who will be forced to endure long periods of weightlessness in the more advanced missions.

Application of use of Aquareset in the home will probably necessitate a considerable re-education on the part of the general public. It does not mean to say this cannot be done. In fact, it is in with the prototype of PR and educational campaign it should be possible to change a mode of living, a way of life, which has remained constant throughout civilization.

I am not sure of the statistics on the amount of money Americans spend for various sleeping things in the United States; however, it all seems very high, an excess of one hundred million a year, possibly much higher than that.

I believe that anyone would appreciate the basic advantage which could be gained if the so-called "elite" group in any nation were to be able to greatly reduce the amount of sleep they require and at the same time increase their over-all efficiency. Adding four productive hours to the day could have a tremendous economic effect over a comparatively short period of time. This is particularly important with creative people such as scientists, engineers and executive administrators in various corporations, institutions and universities engaged in research and development activities. Our notoriously slow lead time might be greatly reduced. In fact, it would not be completely improbable that such a breakthrough conceivably could be the key to one of the principal factors in deciding which system of government ultimately wins the protracted conflict which we currently call the cold war.